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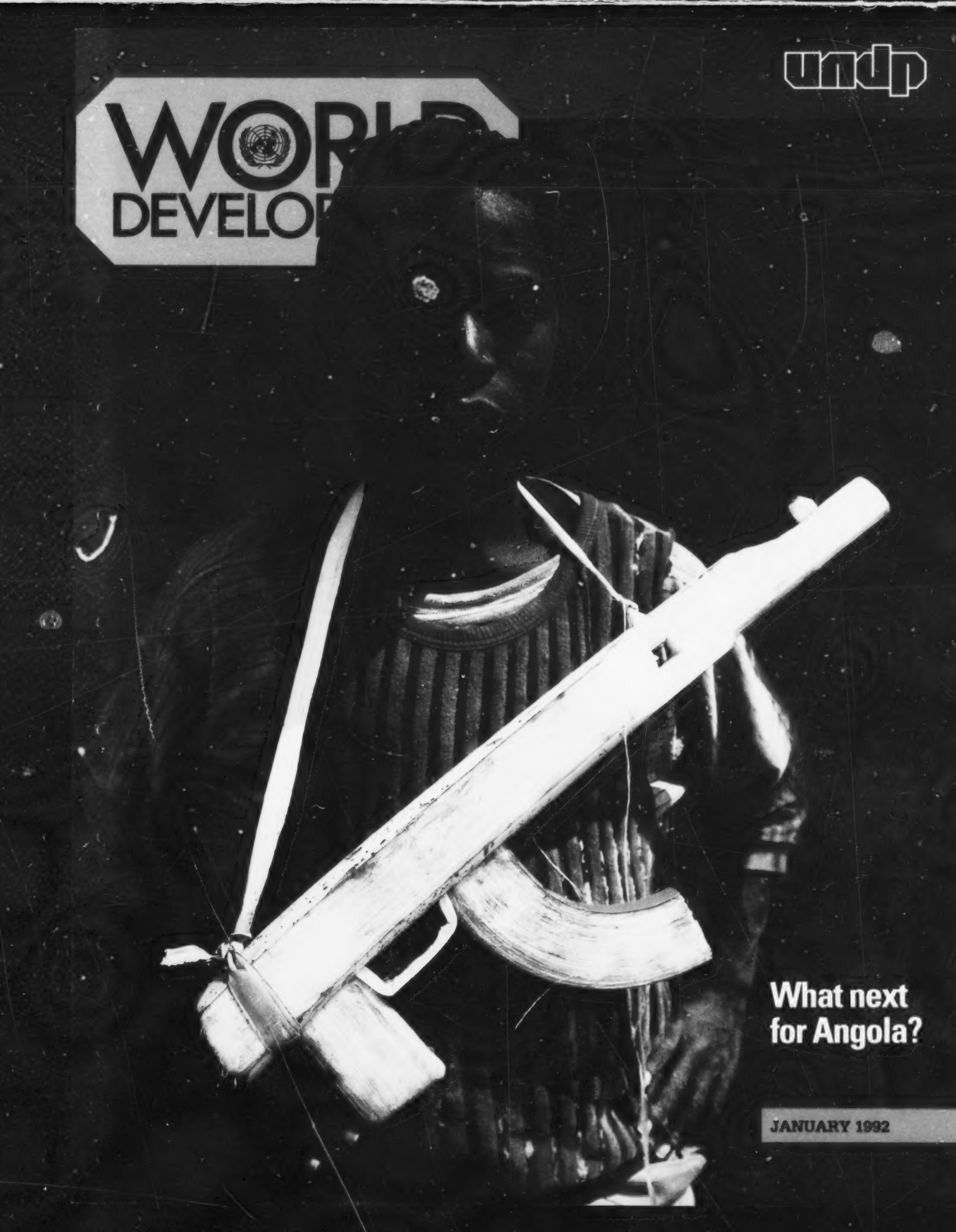

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Photos by Stephanie Hollyman / UNICEF

ANGOLA

After 16 years of war, resource-rich Angola tries to revive its shattered economy

Angola's vast natural wealth includes abundant supplies of oil.

Poised for a New Beginning

By Mary Speck

Luanda, Angola — From afar downtown Luanda still looks like the boom town it once was. High-rise office and apartment buildings curve gracefully around a bay-front boulevard. Neon signs beckon pedestrians to buy the goods of "Sony," "Singer" and "IBM" in small shops nestled under cool arcades. Palm trees sway gently in the breeze along a sandy beach.

Up close one sees that the office buildings have cracked windows and rusty air conditioners that long since ceased to function. Laundry hangs from the balcony railings of once-luxurious apartments. Most of the shops are shuttered, and those that remain open have only a few dusty goods on largely empty shelves. The beaches are strewn with garbage and the water reeks of raw sewage.

But the city once known as the "Rio de Janeiro of Africa" is poised for a new beginning after 16 years of civil war. Hotels are filled with foreign businessmen willing to pay US$100 plus a night for rooms that often lack water or electricity. Privately-owned bars and restaurants are springing up in place of bleak, state-run establishments. Markets are receiving fresh vegetables from rural areas that just a few months ago were cut-off by mine-infested roadways.

"Angola's potential is tremendous," says Otto Essien, United Nations Development Programme (UNDP) resident representative in Luanda from 1988 to 1991. "Given its resource base — and assuming the commitment of the government, the opposition and the private sector to peace and economic reform — there is no reason why it can't be one of the richest countries in Africa."

The peace accord signed in May 1991 between Angolan President Jose Eduardo Dos Santos and rebel leader Jonas Savimbi has finally given the country a chance to push forward its stalled economic recovery programme. UNDP's Second Country Programme for Angola adopted in 1987 and extended through 1992 focuses on giving the government the technical and managerial expertise it needs to change from a centrally-planned to a free-market oriented economy. More than 60 technical advisors and experts funded by UNDP are working with the government on everything from drawing up Angola's first overall fiscal budget to privatizing hundreds of state-owned industries.

It's an ambitious effort plagued by pitfalls. High-level commitment does not always filter down to the bureaucrats in charge of state enterprises or regulating private industry. Lack of experienced personnel makes even gathering basic statistics a formidable task. Preparations for nationwide elections next year make it difficult for the government to undertake painful but necessary austerity measures. "The intellectual commitment is there, but I'm not sure they have made the psychological transition (to a market economy) yet," says Mr. Essien. "There is a fear of the unknown and a certain measure of vested interest against change that makes it difficult to move quickly."

Few countries in the world enjoy the abundant natural wealth that is already attracting private investors to Angola's war-torn capital. Sub-Saharan Africa's largest oil producer after Nigeria,

Street kids in Luanda.

Angola also has tremendous hydro-electric potential. Before 1975, Angola was the fourth largest producer of diamonds in the world and it still has huge unexploited deposits. With a climate ranging from humid lowlands to a vast, well-watered central plateau, Angolan farmers can cultivate a variety of tropical and temperate crops. Fishermen plying the waters off the country's long Atlantic seaboard can catch tropical fish to the north and colder water species to the south. And Angola's rain forests are rich in valuable timber such as ebony, sandalwood and rosewood.

Moreover these riches are enjoyed by a population of only nine million, about seven inhabitants per square kilometre.

But few countries have suffered a more precipitous economic decline. War, drought and an ill-conceived effort to nationalize commerce have transformed Angola from an agricultural exporter to a nation of subsistence farmers. Once the world's fourth largest coffee producer, Angola's harvests are now less than six per cent of pre-independence levels. Once a net exporter of sugar, Angolan consumers today must search for imported sugar on near empty store shelves. Angolan grain production, which formerly helped feed neighbouring countries, has declined to the point where the country is accepting emergency donations from international relief agencies such as the World Food Programme. Even diamond exports have fallen drastically due to insecurity in the war zone and large-scale smuggling.

Only oil production, fueled by foreign investment, expanded steadily during the 1980s. Crude oil and hydrocarbon exports now account for more than 90 per cent of the country's total export proceeds and provide about 60 per cent of government revenues. Such one-sided wealth has its drawbacks. When oil prices dropped in the mid-1980s, World Bank economists estimated that the country's gross domestic product may have fallen about 11 per cent.

The value of Angola's oil exports still gives the country a per capita income of $840, placing it among the middle-income developing countries of Africa and Latin America. But other indicators put Angola among the world's least developed nations. Life expectancy is only 45 years. And Angola shares with Mozambique the world's highest infant mortality rate of 173 per 1,000 live births.

Reviving Angola's economy will depend largely on its ability to acquire one of the few resources the country lacks — skilled manpower. At independence 300,000 of the country's 340,000 Portuguese settlers fled the country leaving behind a population that was 85 per cent illiterate. "The main problem here is the lack of trained manpower," says Tanisly Pamplona, a UNDP consultant working with the government on privatization. "Even with government commitment that makes it very hard to get things moving."

With the massive exodus of the Portuguese the government suddenly found itself with abandoned factories, hotels, restaurants and plantations. Today the state runs some 500 industrial enterprises, 60 of which have been earmarked for immediate privatization. "No one really knows how much has been spent over the years to support inefficient industries," says Mr. Pamplona. "The reason the government wants to get rid of them is not because it hopes to make money on the sale but because it wants to stop losing money."

But with few prosperous Angolan entrepreneurs — or a stock exchange to foster local capitalism — the state is depending on foreign investors to take over major enterprises. "It's not that the state wants to play a big role anymore," says Helder Azevedo, adjunct director of the Foreign Investment cabinet. "It's just that, without a strong private sector, only the state and foreign investors are able to make major investments."

The situation is further complicated by uncertainty over who owns what. Different ministries may simultaneously claim control over the same properties. Moreover some Portuguese entrepreneurs are coming back to reclaim their former businesses and farms.

Mary Speck / UNDP

Antonio Gabriel Enoke, 24, has spent half his life as a UNITA soldier.

"We were officially allocated a large downtown building," says Steve Sharratt, finance manager for Hull Blyth, the Angolan subsidiary of a British shipping agency. "Then we found that another company was already renting it from the government. To make matters worse, the original owner has come back claiming the property was never properly nationalized."

Many small restaurants and shops have been sold or leased to private owners along with some coffee plantations. But in the meantime larger state enterprises are languishing with too little foreign exchange for inputs, too little capital for investment and too many employees. Jose Albertino Cardoso, the general manager of Cerval, a state-run brewery in Luanda, says the factory is operating at about 20 to 30 per cent capacity. "We have neither the credit to import the raw materials we need, nor the electricity we need to run the machines nor the water we need to brew the beer," he says.

Absenteeism among Cardoso's 700 employees runs routinely at about 14 per cent. But labour laws prevent him from firing anyone. Besides, Mr. Cardoso says, his employees often have legitimate reasons for missing work. "Finding transportation, medical care, even food is a constant struggle here. Until the overall situation improves we can't expect employees to give 100 per cent to their jobs."

Lack of inputs and low productivity at Angola's state-run breweries means that domestic producers are able to satisfy less than 40 per cent of domestic

War, drought and ill-conceived policies have transformed Angola from a food exporter to a nation of subsistence farmers.

Stephenie Hollyman / UNICEF

Stephenie Hollyman / UNICEF

Because of internal security problems, this young boy was not vaccinated for polio.

Mary Speck / UNDP

A new market outside Lubango: Until recently the government controlled almost all commerce.

demand. As a result Angola is Africa's largest importer of beer. Even with large imports there is a thriving black market in the beverage. Beer, sold at low official prices in state stores and resold at higher prices on the black market, is the favourite commodity for barter. Many employers pay their workers at least partially in beer and other foodstuffs. Market women prefer a case of beer to a fistful of Angolan currency in exchange for sought-after items like fresh fish.

Angola has two economies: a rapidly shrinking official economy where a few goods can be purchased at cut-rate prices and a growing black market known as the *candonga* where virtually anything can be obtained at much higher prices or through barter. The situation is most serious in the agricultural sector, which supports about 70 per cent of the Angolan population, where a combination of war and the government's misguided attempts to nationalize rural trade has eliminated most commerce. After independence the government took over rural stores and set fixed prices for all agricultural commodities. The bush traders who once bought produce and sold merchandise, providing credit during the lean season between harvests, disappeared.

Although many of the rural stores have been returned to private owners, their shelves are largely empty. With nothing to buy, farmers have little incentive to sell their excess produce. "There are farmers with more maize than they can consume," says Luis Cambuta, a merchant in the town of Chibia in southern Angola. "But they don't bother to sell it because there is nothing to buy."

Despite the enormity of Angola's economic problems, some progress has already been made. An eight-person team from the International Monetary Fund financed by UNDP is helping draw up the government budget in an attempt to control a fiscal deficit projected at more than $1 billion in 1991, or about 22 per cent of estimated GDP. UNDP consultants are advising the Ministry of Planning on macro-economic reform with an emphasis on using government resources and international aid to foster private sector growth. Still another team is helping the government restructure its civil service while economists and statisticians are helping to gather accurate economic and demographic data.

Peace may also enable the government to move forward with long-delayed regional development programmes. A multisectoral programme for the reconstruction of southern Angola has already been prepared by UNDP consultants in cooperation with the Ministry of Planning. The government now hopes to extend similar programmes throughout the country.

"Now is finally the pay-off," says Alex Margach, UNDP assistant resident representative in Angola. "With peace we can for the first time start implementing development programmes we've been planning for years." ■

Collecting food aid in Huambo Province.

Photos by Mary Speck / UNDP

Displaced families in Sambo are returning to their villages and rebuilding their homes.

Angolan farmers rebuild ruined villages

Returning Home to Stay

Sambo, Angola — The mud-brick huts are nearly finished, the fields are cleared, hoed and ready for planting. The homesteads of Sambo — twice abandoned, and twice rebuilt — are once more bustling with activity.

The peace accord signed on 31 May has changed the face of the Angolan *planalto*, the cool central plateau that was once the country's breadbasket. Thousands of peasant families are going back to their villages, often without food, shelter or the simple farm tools and seeds they need to plant their crops. After years of living the life of refugees within their own country, they are eager to return to the land that provides their livelihood.

"We just want to be able to take care of ourselves like we did before," says Valentino Sambo, the top tribal leader in Sambo, a rural community of about 9,000 people. "But now we don't have any seeds, we don't have any plows and we don't have any cattle."

The United Nations launched an emergency appeal in November 1990 to feed some 1.9 million people affected by prolonged drought and civil war. Since then, as the end of the fighting has opened up more territory to relief workers, the number of needy people accessible to help has increased. As troops from both sides demobilize and move into assembly points under the supervision of UN peace-keeping forces, the appeal has been expanded to include food and shelter for 130,000 government soldiers, plus 50,000 UNITA rebels and about 70,000 of their wives and children.

Now that the fighting is over, food aid is not enough. Relief officials predict that Angola will also need massive donations of seeds and farm implements, at least until the harvests of 1993. The effort to wean the country from dependency on hand-outs is already beginning. "We are trying to get out of free distribution as soon as possible," says Ramiro Lopes da Silva, director of operations for the World Food Programme in Angola. "We prefer to distribute 'food for work' in projects to rehabilitate rural infrastructure."

Rebuilding rural infrastructure will require a massive effort. On the road from the interior provincial capital of Huambo to the port of Lobito, town after town is a collection of bombed or blown-up buildings, some without roofs, some reduced to a pile of rubble. Rural highways are littered with the skeletons of trucks and even army tanks blown apart by mines. Nearly all the bridges crossing the region's numerous streams have been blown up, forcing drivers to inch across precarious structures made from planks and logs.

Rehabilitating wounded men, women and children is another massive task faced by the government and international agencies. Estimates of soldiers and civilians maimed in the fighting range from 15,000 to 50,000. Most of the injured are amputees, whose legs were blown off by land-mines. The International Committee of the Red Cross and other non-governmental organizations working with Angolan health officials have outfitted thousands of amputees with artificial limbs. But in the towns and villages of Huambo province, it is still common to see legless men, women and children hobbling on crutches or pushing themselves in makeshift wheelchairs.

Nor have the casualties from mine explosions ceased. Although joint government-rebel teams are de-mining rural roads, thousands of explosives were also planted in the fields where farmers are now beginning to replant their crops.

The toll borne by Angolan children during the war was especially high. The UN estimates that since 1980 some 500,000 children have died either as a direct result of the fighting or from war-related causes such as malnutrition and disease. In some parts of the country more than one out of three children die before they reach the age of five. As many as 50,000 children have been orphaned or separated from their parents. Working with the government and NGOs, UNICEF has launched an effort to trace and reunite parents and relatives with children now being held in overcrowded orphanages or foster homes.

For the people of Sambo, the peace accord represents the end of 14 years of flight. In 1977 the army forced them to abandon their far-flung homesteads and concentrate in one village. Then in 1984 the growing violence forced them to take refuge in a Catholic mission. Some returned home the following year only to flee back to the mission when fighting resumed in 1989.

Even at the mission they were not safe. Twice fire destroyed their makeshift village on the mission grounds. An epidemic of cholera swept through the camp in 1989. Many children died of malnutrition. And the death toll continues to rise. Two people were killed by land-mines shortly after they returned to the Sambo area.

But the villagers now seem confident that at last the peace will hold. Benjamin Catchiluvia and his two sons have already begun laboriously clearing their fields with a hoe.

"It's hard work with only a hoe. We used to have a plow and two oxen," he says. "But at least I'll be able to feed my family again." — **M.S.**

ENVIRONMENT

CONSERVATION THROUGH HUMAN DEVELOPMENT

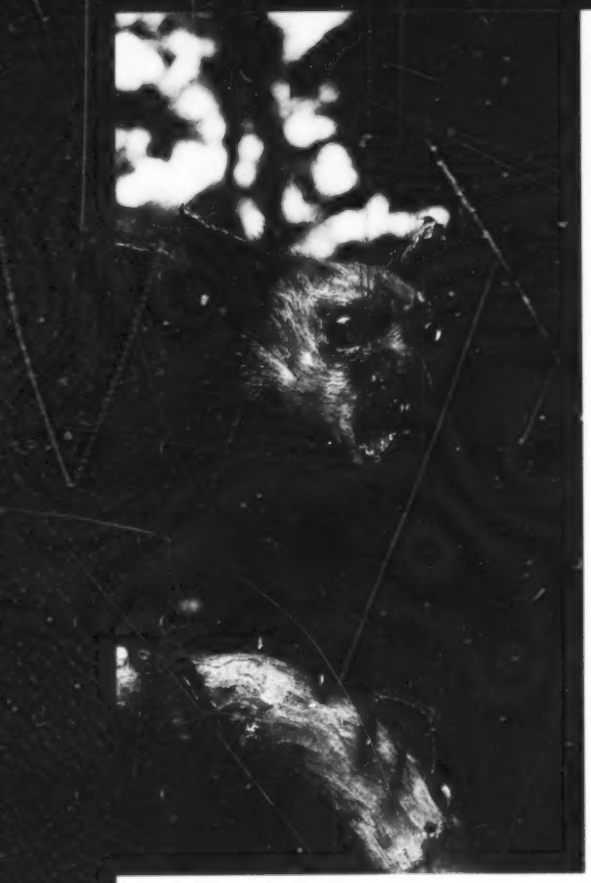
BY EMMA ROBSON

Mananara Nord, Madagascar — On a moonless night, as darkness descends on the coconut tree, the rare and mysterious aye-aye lemur appears in the beams of three torches and stalks cat-like over the branches to the first meal of its day. Staring with amber eyes, it pierces a coconut with ferret-like incisors. Then it lunges a long, skeletal middle finger inside and flicks milk and flesh noisily into its mouth, to the wonder of its audience of tourists below.

For decades, this primitive primate was thought to be extinct. In the 1960s, news that biologists had found it clinging tenuously to life in the tropical forests here in the northeast corner of Madagascar caused a sensation in the international scientific community.

But beyond the forest treetops, near Mananara village, another species of primate, *homo sapiens*, also clings precariously to life. Dwelling in palm huts without running water, electricity or sanitation, the people here are locked in a daily battle against disease and malnutrition, which causes more than

TO SAVE MADAGASCAR'S FORESTS, FARMERS ARE BEING HELPED TO GROW MORE FOOD



F. Vollmar / World Wildlife Fund - US

Aye-aye lemur.

MADAGASCAR

Photos by Emma Robson / UNDP

Rice is the staple food of Madagascar.

one in 10 children to die before reaching their first birthday. The island's unique forests and wildlife are a treasure trove to conservationists, who rank the country third in the world in terms of its biodiversity. But destruction of these forests offers Madagascar's rural poor their only hope of survival. "The forest," says Malagasy biologist Guy Suzon, "is an enemy they are obliged to fight to satisfy their most important need: to eat."

Until recently, the plight of Malagasy man stirred little concern in either international or government circles. Now, under a plan launched this year by the government and a consortium of donors, biologists are joining with agronomists, health and social workers in a bid to ensure the future of both man and nature.

"Rural people eat lemurs because they are hungry," says Guy Razafindralambo, one of the coordinators of the Environmental Action Plan. "So if we want to save the lemurs and the forests they live in, we have to give people alternatives." To date, the 15-year plan

Cement tanks store water for irrigation.

Photos by Emma Bolden, UNDP

Madagascar's northeast coast offers potential for tourism.

Fishmonger displays her wares in local market.

has received credits and grants totalling US$85 million from donors including the World Bank, the United Nations Development Programme (UNDP), and the aid agencies of Germany, Japan, Norway, Switzerland and the US.

Mr. Suzon is national director of a project, now active in three high priority forested areas, which exemplifies the country's new approach to wildlife protection. Backed with a $1.7 million grant from UNDP, the project's aims are to improve the agricultural output and basic services of communities living near the forested areas, to research plant and animal species within the forests, and to open up selected areas to eco-tourism. The activities are executed by the UN Educational, Scientific and Cultural Organization (UNESCO), which has declared the sites protection zones.

The first challenge was getting Malagasies to stop cutting the forests. "We only give help," says Mr. Suzon, "if they agree to stop cutting the forests." For those who agree to do so, the rewards are rich. Families cooperating with a team of more than 30 locally-hired extension workers are offered agricultural training, tools, seeds, schools, improved water supply and latrines. Prior to beginning these works, the project team spends several months conducting socio-economic surveys and setting up local works committees, which decide on what improvements they need most. They also contribute their own labour.

A major priority of all rural Malagasies is to grow more to eat. While the country is the fourth largest island in the world, and slightly bigger than France, it has trouble sustaining its 11 million people. Most of them farm land exhausted by overcropping and parched by deforestation, which has reduced the soil's capacity to absorb rainfall. "Twenty years ago, farmers would remain on a plot for 10 years," says Malagasy agronomist Vivianne Ralimanga. "Now they burn new plots every five years because the soil has become poorer and the population has grown."

With an annual per capita income of $210, Madagascar ranks among the world's 10 poorest countries, and it is getting poorer. Only once in the past 10 years — in 1990 — has economic growth topped the three per cent average growth rate of the population.

Years of neglect by government and marked declines in commodity prices have helped make the northeast one of the country's poorest areas. Ten years ago, the 600-kilometre coastal road linking the regional centre of Mananara

Slash-and-burn techniques destroy forests at an alarming rate.

with the major port of Toamasina on the eastern seaboard served as an adequate link for imports and exports. Nowadays, however, the road is impassable during the six-month rainy season. Even in dry weather, deep potholes make it difficult for a four-wheel-drive vehicle to cover more than three kilometres in one hour.

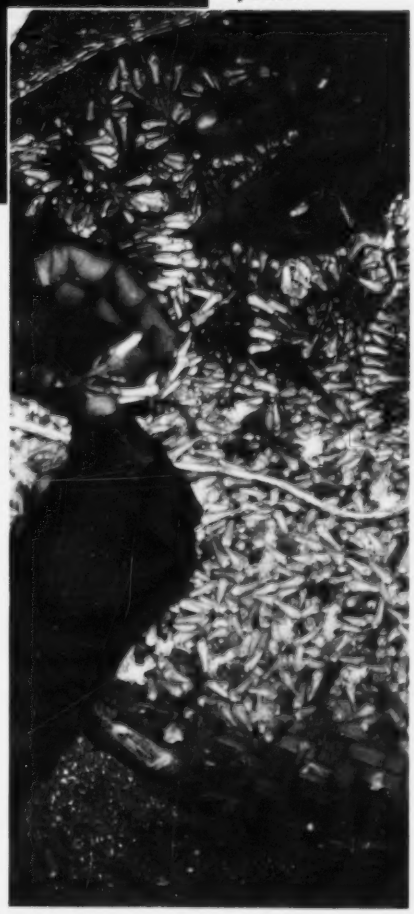
The isolation cuts two ways. Families in the region are unable to buy imported food to supplement their diets even though locally grown crops meet only three-quarters of their nutritional needs, according to project workers. At the same time, because of transportation difficulties, local farmers are forced to accept derisory prices from middlemen for their main cash crops, cloves and vanilla. "Last year farmers were getting one-third of the official price for their cloves," says Charles Rabe, a project researcher and native of the area. As a result, families' cash incomes averaged less than $100, and it is not unusual to see children whose hair has turned strawberry blonde as a result of severe protein deficiency.

Besides boosting food production, one of the aims of the project is to seek alternative sources of income through tourism and the manufacture of handicrafts. As yet, Mananara boasts only three simple hotels, whose one-room bungalows are made of the indigenous rafanala palm that proliferates in the tropical east. At the urging of Mr. Suzon, who is based permanently in Mananara, local businessman Roger Rakoto has expanded his simple restaurant into a hotel with 11 palm bungalows. "We're at 70 per cent capacity all year round," says Mr. Rakoto proudly. "Soon we hope to have running water."

After years of doing little to boost tourism, Madagascar's government is now actively promoting the industry, which will need to grow virtually from scratch. Annual tourist arrivals now average little more than 30,000, which is one-tenth the number of visitors the neighbouring island of Mauritius receives on a territory 1/300th the size.

Still, the country has considerable tourism potential, and the Mananara

Picturesque Ranomafana National Park.



Clove prices have plunged in recent years.

region is no exception. Besides the two aye-aye lemurs, which have been isolated on a small island owned by Mr Rakoto to make them easier for researchers to study and visitors to see, it offers pristine, palm-shaded beaches, dotted with oyster shells the size of footballs. A short boat trip away lies Nosy Antasana, a marine park whose large coral reef harbours a dazzling array of exotic fish and plant life.

The park will soon be open to tourists. But first, environmental specialists must assess to what degree the reef has been destroyed and its fish stock depleted by local fishermen, whose pirogues are unable to fish out in deeper waters. One marine biologist is cataloguing the animal and plant life of the reef, and fishing experts have been hired to teach fishermen how to build sturdier boats and use larger nets, which will allow them to fish in deeper waters beyond the reef.

Since late 1988, when project activities were launched in the Mananara area, more than 700 families have improved production of rice, the national staple. People have built irrigation channels and learned how to increase yields by weeding the rice fields with hoes and planting in neat lines. "We have reduced the amount of forest lost through slash-and-burn to 50 hectares per year from 120 hectares in 1988," says French socio-biologist Roland Albignac, who manages the project.

Such results are encouraging, but represent little more than a start. Each year, Madagascar's rural poor clear an average of 250,000 hectares of forest. In doing so, they are rapidly endangering species which hold information vital to the understanding of natural history. Severed from the East African mainland 160 million years ago, Madagascar is thought to have more endemic species than any other country in the world. Nearly half its birds, more than 90 per cent of its reptiles and primates, three-quarters of its plants and nearly 100 per cent of its palms, are found nowhere else on earth.

Already, dozens of creatures have gone the way of the dodo, once endemic to the island, as man has stripped an estimated 80 per cent of the country's original cover. Madagascar was once home to giant tortoises, a dwarf hippopotamus, and the elephant bird — the largest bird that ever lived. Three metres high and weighing 400 kilograms, it laid eggs weighing nine kilos.

Besides providing clues to evolution, Madagascar's natural heritage contains information vital to current and future medicine. A native herb, the rosy periwinkle, has been found to offer the most effective treatment available for childhood leukaemia and Hodgkin's disease. Several species of unique wild coffees grow virtually caffeine-free, offering tremendous commercial possibilities. The 29 species of lemurs are unexplored gene banks that share many characteristics with man. For example, many of Madagascar's plant scarring agents were discovered by people who

watched lemurs rub certain leaves on their wounds, and found they helped heal their own cuts. Lemurs, moreover, have been observed to carry malaria without developing any symptoms. "Their apparent immunity," says Mr. Albignac, "offers exciting possibilities for development of a vaccine for humans."

That those possibilities will be lost unless conservation is linked to measures to combat deepening rural poverty is now accepted by all parties involved in Madagascar's new environmental plan. "We donors are all in agreement now that while conservation of biodiversity is the end goal, development has to come first," says Mr. Albignac.

In many protected areas, a shift in strategy is evident. The Worldwide Fund for Nature, which has financed research in Madagascar since 1963, has begun rural development activities to complement its research work. "You can't just put a fence around a protected area," says Ira Amstadter, programme officer for Madagascar at the Fund's US branch in Washington, DC. In the Ranomafana National Park in the east of the country, researchers from the US, who until recently confined their work to lemurs, are now helping farmers improve rice production and diversify their crops with a grant of $3.4 million from USAID.

The Environmental Action Plan is overseen by the National Office for the Environment, a unit set up to coordinate all environmental activities of donors, non-governmental organizations and executing agencies. "We have to maintain close contact with all donors to avoid a duplication of activities," says Ms. Ralimanga, the agronomist.

The unit has a major task ahead of it. "Teaching people not to slash and burn, but to cut wood rationally, is only part of the plan," says Mr. Razafindralambo. "We're going to do environmental education in schools, to train people as forest guides, hoteliers and restaurateurs. We also have to draw up a comprehensive set of laws on the environment and enforce them."

Government poster promotes environmental protection.

Photos by Emma Robson / UNDP

Besides helping to coordinate the action plan, UNDP is broadening its rural development activities in threatened areas. The UNESCO project is being extended to protect more regions, while a new series of activities is being launched by Conservation International, a non-governmental organization based in Washington, DC. Through this NGO, UNDP is contributing $2 million over five years to purchase a tiny portion of Madagascar's $3 billion foreign debt. The hard currency obligations, selling at a 50 per cent discount will actually give Conservation International $4 million.

Roughly half this money will be spent on rural development activities, and environmental education at the grassroots, as well as at the national university, which will start offering a course in environmental management. The rest of the money will be placed in an endowment fund where it will earn interest to be used later for environmental activities.

How far that money stretches is another question. The government estimates it needs $800 million to meet its goals within 15 years. The country's biggest hope is to generate foreign exchange earnings through a tourism boom, which would supplement savings already being garnered through a 10-year-old government programme to cut spending.

Besides, lack of money is only one obstacle in the country's struggle to prevent further environmental degradation. "The real challenge is getting people involved," says Mr. Razafindralambo. "Only with the full cooperation of all 11 million Malagasies can we begin to succeed." ■

Women in the Gujar family take turns milking.

Photos by Denise Barricklow / UNDP

CONSERVATION

Promoting Peace between Man and Beast

BY DENISE BARRICKLOW

Dehra Dun, India — Half a century ago, deep inside the lush forest near the bustling northern Indian city of Dehra Dun, in a remote spot known only to wild elephants and the occasional tiger, Main Gujar (*above*) built a home for his family. Here, surrounded by greenery, in a sturdy thatched hut furnished only with an array of immense wooden cots, Mr. Gujar has led a spartan but happy life, raising a small herd of water buffaloes and dairy cows, like his forefathers before him.

A profound sense of peace seems to pervade the hut, as the graying grandfather recalls the countless days he has spent with his sons and a set of claw-shaped axes, lopping off branches of the young forest trees whose leaves his cattle find so tasty. Outside the hut, the whisper-thin women of the family silently cluster around a dusty white cow, taking turns coaxing milk into small tin pails. The family will later sell the milk in the small villages that dot the edge of the forest.

But the serenity of this insular world where many do not even know their

Bruce Bunting / World Wildlife Fund - US

age — Mr. Gujar guesses he's somewhere between 60 and 70 years old — is a blessing that's unlikely to last. Possibly as soon as next year, the Gujar clan will be ousted from the place they have called home for the last 50 years. The forest where the family lives is slated to be cleared of all settlers once the last bit of paperwork goes through, officially declaring the 820-square-kilometre wildlife sanctuary a national park.

The Indian government has proposed moving Mr. Gujar and his family from their hut into one of about three dozen resettlement camps constructed around the country to help house those who have been uprooted as a result of conservation efforts. The camp was built for the more than 500 families, like the Gujars, who live in the future Rajaji

Saved from extinction: snow leopard and great Indian rhino.

Eric Dinerstein / World Wildlife Fund - US

Working toward a more humane approach to conservation

Photos by Denise Barricklow / UNDP

Wildlife Institute field trip to future Rajaji National Park.

National Park. Currently, however, it remains empty. Unaccustomed to the miracle of modern plumbing and the aesthetic beauty of concrete, the forest settlers are adamantly opposed to moving into the camp's cramped one-room homes. And a class-action lawsuit to fight the government's relocation plans has even been filed.

"The government cares more about the animals than us," pipes Mr. Gujar. "My family has been here for a long time. We don't want to go to the camp. We want to stay here in the forest where we have been happy. We want to live like our ancestors."

Mr. Gujar's discontent is shared by tens of thousands of other impoverished cattle rearers, game hunters and farmers who have been displaced or seen their livelihoods disrupted since the passing of the Wildlife Protection Act in 1972.

Two decades ago, the forest settlers' pleas may have gone unheeded by conservationists whose principal interest was rescuing endangered animals from extinction. Then, saving the snow leopard, the mugger crocodile or the Asian elephant took priority. Today, the survival of the people living in and around the national parks and wildlife sanctuaries has become a top concern for many environmentalists.

"The animals are suffering, but so are the people, who are dependent on the forest for their food, fuel and fodder," says B.K. Mishra, a zoologist who has recently devoted his time to a study of the problems faced by the settlers in the future Rajaji National Park. "There is a real conflict of interest here. And park management has to do something about that."

Mr. Mishra is one of a host of experts working at the Wildlife Institute of India, a training and research facility located in Dehra Dun. The institute helps mid-career forestry workers and scientists from all over India and other developing nations in Africa and Southeast Asia discover new ways of easing this painful conflict between man and animal. It is funded by the Indian government, the United Nations Development Programme, and the Food and Agriculture Organization of the United Nations.

V.B. Sawarkar, head of wildlife faculty management at the institute, says the trainees are taught to see themselves as something more than animal caretakers and park policemen. They learn to become troubleshooters, who work with people, not against them. Good public relations skills are crucial, explains Mr. Sawarkar, because few forest settlers have come to realize how their presence can harm the environment in a way that will ultimately work against them.

A perfect case in point is the Gujars, who insist that their branch-stripping habits bear no relation to the fact that many of the trees they have used to feed their cattle are sick or dying. The real culprit, asserts Mr. Gujar's mother-in-law, is the weather. "The rain hasn't even been able to cool the earth this year," she says. "This is what has caused the trees to dry up."

Mr. Sawarkar says the institute's non-traditional style of forestry training has already led to some success in the field. "We had a trainee two years ago from the tiger reserve at Melghat Park in central India who did a wonderful job getting help from the local villagers in stopping arson fires," Mr. Sawarkar recalls. "The villagers were actually brought into the field, shown burned patches and told, 'This is what happens. Your supply of medicinal plants is finished. You will not get tubers to eat.' So they were quite enthusiastic about helping out."

Now the area's free-wheeling cattle ranchers, who like to torch forest fields as a way of speeding up grass growth for their hungry animals, have seen their efforts stymied by a crew of fire scouts who maintain round-the-clock vigils in the park. The scouts look for the first signs of smoke — before the flames get out of control. "It's worked out beautifully," Mr. Sawarkar says.

Pits filled with cow dung produce biogas.

Historically, the forestry department has not enjoyed such a cozy relationship with those who live in or near the country's nearly 500 national parks and wildlife sanctuaries. And even today, Mr. Gujar's belief that the government is more concerned with animals than people remains a common conviction in much of rural India, where roving tigers, elephants, and other wildlife have claimed hundreds of lives and destroyed countless hectares of crops.

This perceived government favouritism has sparked bloody battles around the country. In the early 1980s, for example, pandemonium erupted after a brick wall was erected around a bird sanctuary in Ghana National Park, where villagers had been grazing their cattle. "There was a face-to-face confrontation. The villagers came with weapons, firearms and some people were killed," recalls H.S. Pabla, an assistant director of the institute.

Fortunately, Mr. Pabla says, the violence has tapered off in recent years. "There used to be a communication gap between the top and the field levels. Now everybody has learned that you cannot enforce the law unless you give people alternatives."

At the institute, the trainees brainstorm about ways they can help people reduce their food, fodder and fuel demands on the forest. This has led to the installation, in some villages, of solar-powered cooking stoves and biogas plants, which provide heat and electricity with gas produced in pits filled with cow dung.

This same type of creative problem-solving is something the institute's faculty teaches the trainees to use when dealing with wildlife. "If we're talking about the swamp deer, we tell our trainees not to go out into the field and just look at the animal," explains Mr. Sawarkar. "We tell them they must also try to determine whether the animals have the right amount of food, whether the swamp is being threatened by fishermen."

"This kind of evaluation can lead to the formulation of management strategies. For example, if you determine that the swamps are drying out, you could put in a pump and fill it back up by running it for a couple of nights."

The institute has seen its theory put into practice in a number of successful wildlife projects overseen by the faculty researchers who work with endangered animals. The mugger crocodile, for example, was on the verge of extinction in the early 1970s, with less than 200 of these freshwater animals managing to keep their valuable hides intact in the midst of a poaching frenzy. But thanks to a project launched in 1974 that led to the in-captivity breeding of more than 900 mugger crocodiles, the beast has officially been declared out of danger. "It's been a big success," says Dr. Sushant Chowdhury, who oversees the mugger crocodile project at the institute. "When we started, we didn't know if crocodiles could be bred and reared in captivity."

A similarly successful experiment in Dudhwa National Park has seen the resettlement of a group of Great Indian rhinoceroses who were moved there in 1984 from Nepal and from another Indian park in Assam in an effort to protect this endangered animal. And although four of the nine original rhinos that were brought to Dudhwa died, the surviving animals have managed to bring into the world five healthy calves, increasing the horn count to 10. "It's still in the experimental stage because we don't really have a viable population yet — we need to move in about 50 more rhinos — but so far we think it's been a big success," says Dr. S.P. Sinha, the scientist who oversees the project.

But if the institute has had success relocating wildlife, faculty members are adamant in insisting that the same type of strategy is not a humane alternative for people. "We have certain primitive tribes who are still hunters and gatherers," notes Mr. Sawarkar. "They have been nomads for centuries. They hate to stay in one place. You can't take these people out of their environment and put them in some resettlement camp. It's like caging a tiger and thinking the tiger will be extremely happy because he's getting 10 kilograms of meat everyday."

Of course, the way the conflict between the animals and the people will ultimately be resolved is not up to the faculty members of the institute, who say they can only hope that government officials will see the wisdom in Mr. Sawarkar's observation and abandon their resettlement efforts. "Already in some of the camps, the people have resorted to drinking and prostitution," says Mr. Mishra. "I feel pity for the American Indians. I don't want to see that happen here." ■

For twins Sam and Samson, daily rehabilitation exercises are like a game.

BENIN

HEALTH

Benin: Helping the Disabled Better the Odds

A community approach to rehabilitation

By Françoise Gerber

Cotonou, Benin — In the front yard of their small house, 11-year-old twins Sam and Samson sit on a woven mat, facing each other. As Sam slowly lies down, his brother carefully lifts his left leg and brings it back down to the ground. "One, two, three," they count together, laughing.

Sam and Samson, who like most people in their community use only their given names, look like any other children playing outdoors. But in reality, they are practising a daily therapeutic routine that has had a significant impact on Sam's life. Both brothers contracted polio when they were babies. Samson, who ironically was more severely affected, recovered completely. Sam was not so lucky. Polio left several of his muscles partially paralyzed.

Less than two years ago, Sam was a disabled child barely able to move and totally dependent on his family. Now, through his daily rehabilitation sessions with Samson, who received special training to help his brother, Sam has regained some muscular control. He also has been equipped with leg braces, and walks to school every day with his brother. "Samson and I are in the same class," he says proudly.

While there is no official census of the disabled in Benin, the World Health Organization estimates that six per cent of its population suffers from physical or mental disabilities. An estimated 228 million disabled people live in developing countries.

In Benin, Sam is among the beneficiaries of a pilot community-based rehabilitation programme for the disabled, supported by the United Nations Development Programme (UNDP). The programme was launched in January 1990 in one district of the city of Cotonou and in the rural area of Comé in Benin.

The government provided a social worker for each of the pilot zones in September 1989 and trained them to act as community-based supervisors. Their role is to identify the disabled in their respective communities and to assess their needs. "We help all kinds of disabled people," says Dominique Lawani, the social worker of Cotonou. "We have adults who need help in starting income-generating activities and children who stay home from school because of their disabilities."

Integration of disabled children into the regular school system is a main objective of the programme which organizes awareness seminars for teachers and school directors in Cotonou and Comé. "Community education and information about the disabled is very important," says Constance Facia, who is in charge of the programme at Benin's Ministry of Social Affairs and Labour. "In most cases, school directors are reluctant to accept disabled children, especially those with cerebral palsy," she says, explaining that it is often confused with mental retardation. It took months to get 10-year-old Romuald accepted in a Cotonou school, but now the boy attends regularly and is working hard. "He is very bright and just needs help to write, because his cerebral palsy makes hand control difficult," says Ms. Facia.

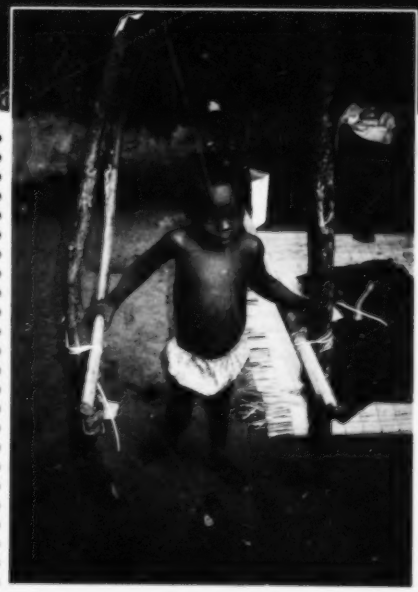
Specialized institutions for the disabled in developing countries are very costly, are not always effective and are only available to a limited number of people. A more practical approach calls for the disabled to stay with their families and improve their condition through simple rehabilitation exercises. It also gives them an opportunity to learn skills that will make them productive rather than dependent members of the community.

"Lately, we have noticed an increasing number of disabled adults begging in the streets of Cotonou," says Ms. Facia. "This is a new trend. The disabled used to be taken care of by their families. But with the worsening economy, a lot of them are now rejected and end up in the streets."

Mr. Lawani travels by motorcycle to visit families in his Cotonou district that request help. One of his most important functions, he says, is to train family members to perform rehabilitation exercises daily with a disabled person. "I select the family member who is most likely to be available for daily practice," says Mr. Lawani. "The mother usually becomes the trainer, but if she is too busy, a sister or a brother is a good alternative." Sometimes, as in the case of Sam and Samson — when a child is the trainer — rehabilitation almost becomes a game and the disabled person tends to progress faster.

Four-year-old Rodrigue, who got polio two years ago, recently started rehabilitation and is being aided by his mother. Mr. Lawani makes sure that the exer-

Françoise Gerber / UNDP

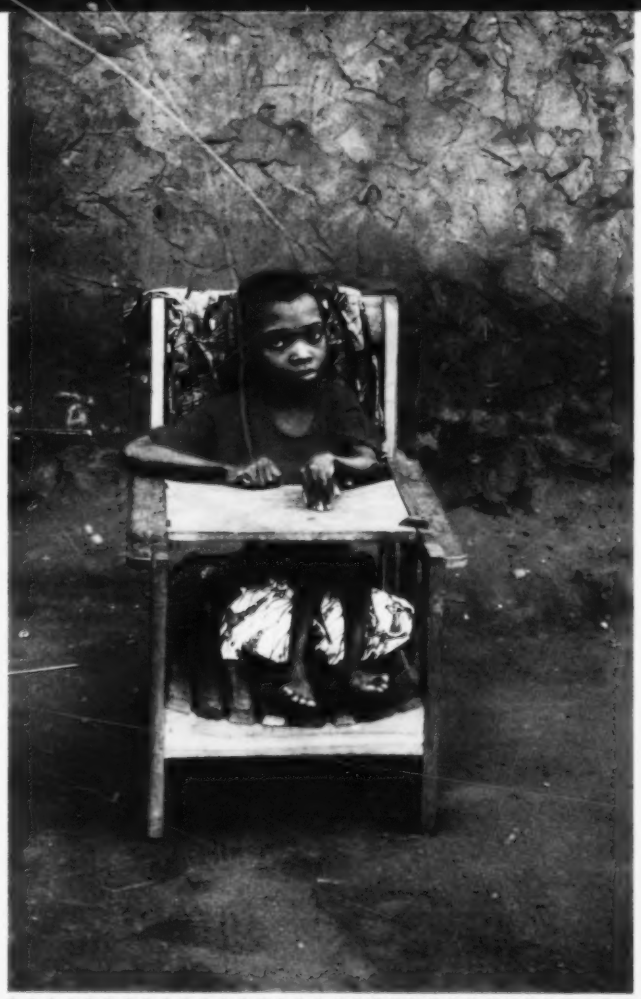


(Top) A mother helps her four-year-old son with polio develop flexibility and coordination.

With start-up funds raised by the community, this disabled man will begin raising sheep and pigs.

Photos by Françoise Gerber / UNDP

(Lower right) The same child learns to walk using handcrafted crutches.



Before receiving this specially made chair, this young girl with cerebral palsy remained isolated at home.

cises, which include leg movements to improve mobility, are done correctly.

While over half of the beneficiaries of the programme are children, the integration of disabled adults into the community is another goal which is equally important. "We are helping train young adults in skills they can use to earn a living," says Ms. Facia. In Comé, a few young disabled women have chosen to learn dressmaking, while a group of deaf men are being trained in car repair.

"In many cases, the disabled cannot afford the cost of an apprenticeship," says Ms. Facia. "When we ask enterprises to take a disabled person, we also ask them to lower the training cost." Usually, the response is good. Trainers charge half their usual fee and are usually proud to help someone with a disability. For example, a young man with cerebral palsy who wanted to learn secretarial skills has been enrolled free of charge in a business school in Cotonou.

Volunteer rehabilitation committees comprised of church representatives, parents of disabled children and community members willing to support the programme have been created in Cotonou and in Comé. Committee members in each region have been very active in raising funds to help the disabled start income-generating activities.

In Comé, being in a wheelchair does not stop 25-year-old Jacques from raising sheep and pigs. The committee collected US$160 to build a pen for the animals. "When a disabled person needs money to start such an activity, we submit a proposal to the committee for possible funding from the community," says Ms. Facia.

Through its division for global and interregional programmes, UNDP has provided a consultant that specializes in the rehabilitation of the disabled, Dr. Einar Helander, who coordinates programme activities in Benin, Chad and Côte d'Ivoire. He is an ardent supporter of the community orientation of the programme. "We have to use a technique that fits within people's possibilities, and we also have to learn from the community itself," he says.

Additional support for the initiative comes from such non-governmental organizations as *Terre des Hommes* and *Médecins sans Frontières*, which provide surgical operations and braces for children.

So far, in the two areas covered by the programme in Benin, over 100 disabled people have benefited. The numbers are expected to rise, as four additional rural communities will be included in the programme this January.

"Community-based rehabilitation requires a long-term effort on the part of the disabled, their families and the community," says Ms. Facia, who is sometimes discouraged when a disabled person gives up in frustration and quits the programme. "But when you see a child who was crawling on the floor, and who, months later, starts going to school, the feeling of reward is worth every effort." ■

Beyond the Fish and Coconuts

By Mary Lynn Hanley

The Kiribati canoe was developed with advice from local fishermen.

Photos by Mary Lynn Hanley / UNDP

Tamana, Kiribati — It is early morning on this coral island in the middle of the Pacific just south of the equator.

As the sun casts its first warm rays, men shimmy up the slender coconut palms to collect the sap used to concoct "toddy," a favourite beverage on the island.

Young people from the Tamana Self-Reliance Movement hack through the thin, dry soil with picks and shovels, preparing the land for a coconut improvement project.

Women draw water from shallow wells near their thatched roof houses with new "Tamana pumps," modeled on devices for bailing out fishing boats. They also lay out copra to dry in the sun, braid rope from coconut fibre, and weave mats from pandanus leaves.

As the sun rises higher in the wide Pacific sky, preparations for the midday meal begin. There is fresh fish, caught by the men in their improved canoes, and tree cabbage and breadfruit, plucked from branches in the yard.

Despite the isolation of its 33 atolls, poor soils and lack of rainfall, Kiribati is working to make the most of its meagre resources, harness the considerable

Community development in the Pacific and Maldives

energy and talents of its people, and overcome dependence on foreign aid.

Tamana, five kilometres long and a little over one kilometre wide, is the country's smallest island, with a land area of 525 hectares and a population of about 1,000. It was chosen as one of the first locations for the Integrated Atoll Development Project (IADP), supported by the United Nations Development Programme (UNDP) and executed by UNDP's Office for Project Services.

"Tamana is one of our pride and joys," says Jeff Liew, regional project co-ordinator, a Malaysian based in Fiji, where the IADP is headquartered. He beams with satisfaction at the sight of the well-maintained solar water pumping station and the construction underway at the boat-building workshop. He takes pride, too, in the squash and cabbages now growing in a swampy pit where community members previously cultivated only the giant swamp taro for its edible root and elephant-ear sized leaves. Everywhere there is evidence that the islanders have sustained and built upon activities begun in 1985 to ensure clean drinking water through provision of wells, pumps and rainwater catchment tanks, as well as to improve nutrition and equip Tamanans with skills.

Mobilizing local leadership and encouraging people's participation, the project has made its mark over the last seven years in 20 remote communities in the Cook Islands, the Federated States of Micronesia, Kiribati, the Marshall Islands, Tokelau and Tuvalu, all of which are in the Pacific. It has done the same in Maldives, in the Indian Ocean.

An atoll is a group of low coral islands on the rim of a submerged volcano crater which forms a lagoon. There are close to 300 in the Pacific and 19 in the Indian Ocean. Although often beautiful to behold, they pose special problems when it comes to establishing and maintaining the transport and communications systems vital to island economies. Often, inaccessibility is exacerbated by treacherous reef passages and the lack of safe harbours. Coastal erosion is a constant concern. The islands are ever at the mercy of tropical storms and high seas.

Atolls have few natural resources beyond fish, coconut, breadfruit, pandanus — a sweet fibrous fruit — and occasionally some taro and bananas. Clay is not available for making bricks and pottery. Fresh water is scarce and often contaminated. The poor calcium carbonate soils, lack of surface water and unreliable rains make agriculture extremely difficult. Vegetables are rarely cultivated and consumed, resulting in a high incidence of night blindness among children due to vitamin A deficiency.

On the more accessible islands, the availability of imported processed foods has only worsened the diet. Obesity, high blood pressure and diabetes are common due to the consumption of junk foods laden with fat, salt and sugar. In Tarawa, the capital atoll of Kiribati, shops stock no less than seven brands of tinned corned beef. "The can opener is the island's most important agricultural implement," says Mr. Liew.

Atolls are also affected by the same problems which hinder development in other small island countries. There is a

National planning officer Kokeaki Kose helps a Tamana woman prepare pandanus leaves for weaving.

Tamana Self-Reliance work crew.

Photos by Mary Lynn Hanley / UNDP

The Tamana pump was modeled on a device used to bail out fishing boats.

great deal of migration and many families depend upon remittances from relatives working abroad. Skills and personnel for industrial enterprises are limited, as is access to markets. Most atolls rely heavily on the government for subsidies, as well as for basic health, education and other services. But they are often short-changed due to strained budgets, difficulties in delivering services to remote areas, and insufficient knowledge of local conditions on the part of central authorities.

To meet the many challenges of atoll development the project is helping to equip local communities with the skills and knowledge they need to manage their own development. It is also encouraging traditional island leaders and villagers to assess their own problems and determine a course of action in line with community goals. Small-scale projects based on the use of local resources are mounted to increase income. A team of national trainers is formed to sustain activities and spread them to other atolls. Non-governmental organizations are encouraged to participate.

The need to approach each island on its own terms was recognized early on when it became evident that resources, priorities and aspirations may differ widely, even on islets within the same atoll. In the Maldives, Meemu atoll, comprised of nine islets, is a good example. Many people on Mulah, which has good soil and water conditions, have taken up agriculture. The islet even exports surplus squash and melons to Maldives' capital of Malé. But the residents of nearby Veyvah, where fertile soil and adequate water are limited, depend entirely on fish, sea cucumber and other resources from the ocean.

To assist communities in identifying and acting upon their priorities, United Nations Volunteers (UNVs) live and work in each atoll assisted by the IADP. All have come from the Philippines, which has extensive participatory development experience.

Ramon Bobier, a UNV specialist with several advanced degrees and seven years experience as a rural trainer is now in his third year in the Cook Islands. "Mangaia has a lot of potential for development but initially the people were unwilling to take initiative," he says. Mr. Bobier was able to break through their reserve by holding workshops in which Mangaians were encouraged to plan their own activities. They formed a development coordination committee as well as a revolving loan fund which has helped numerous small groups improve their businesses. The vanilla growers' association borrowed to construct a fence to keep out chickens. The woodmen's club bought tools and equipment for their carving. A farmers' group raised vegetables for sale in the capital of Rarotonga. "We want them to be more active as partners in development," says Mr. Bobier, "not just recipients of aid."

One of the most challenging UNV assignments is held by Jaime Janolino, working on five islets of Woleai Atoll in Yap, one of the Federated States of Micronesia. Mr. Janolino's first task was to build up people's trust. "I show them that I am one of them," he says. In addition to helping the people make compost for gardening, generate income by drying fish, and fabricate baskets from pandanus roots, Mr. Janolino has invented a trap to catch flies, which infest the island. He taught two Woleaians

Maritino Kabiriera builds 10 Kiribati canoes a year.

Crafting a Better Canoe

Tarawa, Kiribati — An increasingly familiar sight gliding over the blue-green waters of the Pacific is the Kiribati canoe. Equipped with paddles, sails and an outboard motor, it can go farther out to sea than traditional island fishing boats, is easier to sail, holds more fish, and can be equipped with an icebox to keep the catch fresh. The craft was developed with support from UNDP and the Food and Agriculture Organization of the UN (FAO), and with advice and suggestions from fishermen.

The people of Kiribati eat as much fish as anyone in the world — 150 kilograms per person per year — most of which is caught from small canoes. Since inshore resources are heavily exploited, coastal fishing does not always yield much. Offshore, tuna abounds, but traditional canoes cannot carry large loads of fish. Not very safe in the open ocean, they have no protection against Pacific squalls.

In the early 1980s, a naval architect from Norway brought in by UNDP determined that it would be possible to improve the traditional canoes. He prepared plans for two new types which combined traditional features with innovations to increase their seaworthiness and carrying capacity. One was a flat-bottom seven-metre sailing outrigger canoe for use with a ten-horsepower outboard motor. The second, a vee-bottom craft, requires an engine of about half that size. The first version meets the needs of the urban fisherman, who has fuel readily available and can readily sell some of his catch. The second is suited to the fisherman in the outer islands, where both fuel and commercial opportunities are very limited.

Mike Savins, a United Nations Volunteer boat builder from Australia, was recruited to build the two prototypes, and to instruct government personnel in their construction. The first models were demonstrated to fishermen on 18 islands and three additional prototypes were designed incorporating their suggestions.

Commercial boat builders were also brought on board. By the time UNDP and FAO support ended in 1987, 37 canoes had been constructed using the new designs. Since then, six private firms have built another 86 new boats using the designs.

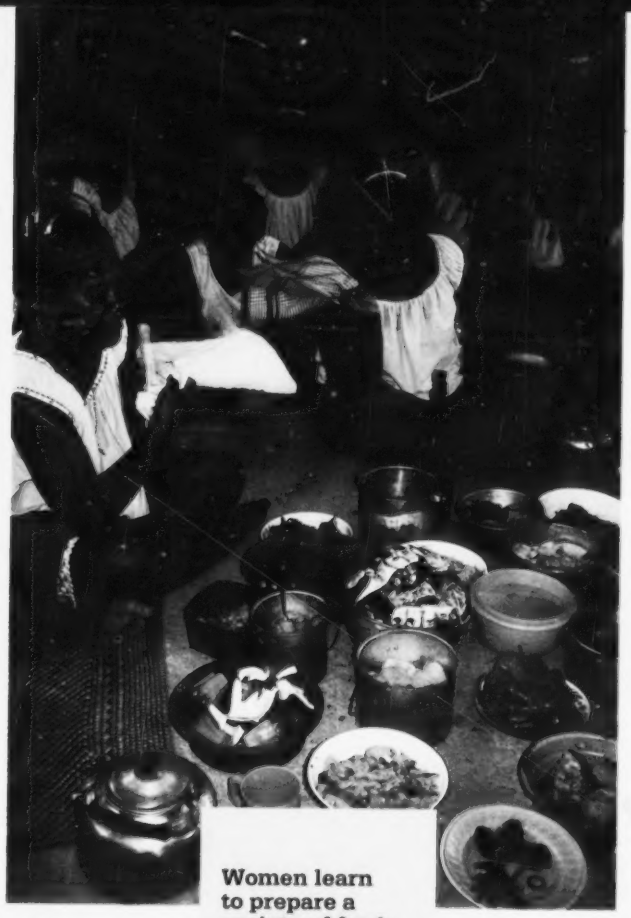
One of the entrepreneurs is Maritino Kabiriera, whose boat building and repair shop is based in Tarawa. Trained by Mr. Savins, he now builds 10 Kiribati canoes a year. "This boat is much better because if the engine breaks down you can still use the sail," he says.

A typical model costs US$3,700. "We thought the boats might be too expensive," says Mr. Savins, "but we found that most owners put cash down. Only 30 per cent have been financed by loans." He adds that as many as 30 people might share in a boat's use in the outer islands.

The Kiribati canoe can now also be found plying the waters of other Pacific island countries. Tokelau, the Cook Islands and Papua New Guinea are among those which have adapted it. — **M.L.H.**

Photos by Mary Lynn Hanley / UNDP

Crops thrive on the island of Mulah, in Meemu atoll, Maldives.



Women learn to prepare a variety of foods at a nutrition workshop in Tamana.

how to make the trap and soon they were passing along this skill to other members of the community.

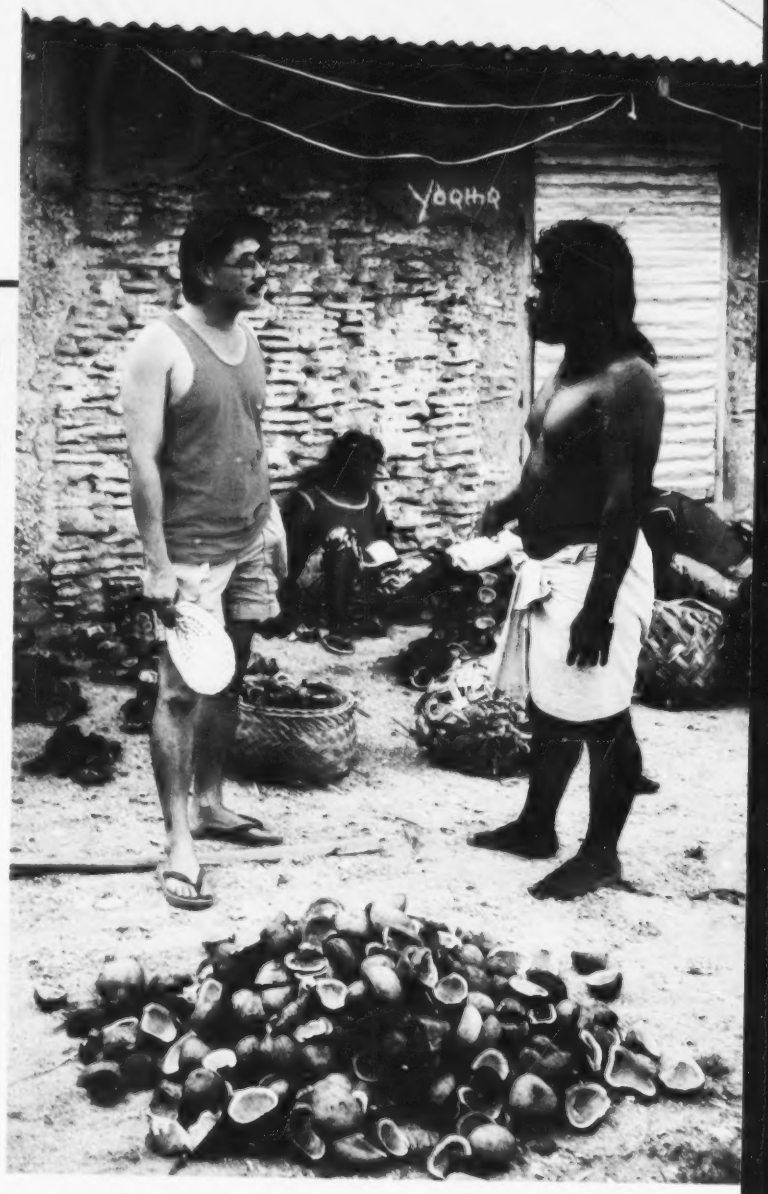
Islanders are encouraged not only to use available natural resources but to create new ones. For example, Franco Mateariki, a consultant from the Cook Islands, has been demonstrating how fertile soil can be made using composting techniques. Among his most avid pupils are island children. "Franco noticed that it is the children who have to sweep up around the house," explains Mr. Liew. "He teaches them to separate the organic matter."

Underlying all these activities is an awareness of the need to protect the fragile atoll environment. Reef blasting — the use of explosives to deepen passages for boats — is carefully weighed against the amount of damage it will do to the underlying coral structure. The use of chemical fertilizers and pesticides is rejected in favour of natural pest control methods. For example, cabbages are grown with marigolds, which repel worms that eat the vegetables.

There is also a deliberate effort to involve women, who do not traditionally play a role in island decision-making. In Tuvalu, women were at first not allowed to participate in meetings and had to rely on men to speak for them. As the male "go between" found himself constantly going back and forth for consultation, it was suggested that the women be brought closer to the meeting site. Eventually the men saw the practicality of bringing women into the workshop itself.

Participating governments have generally been pleased with project results and there are plans to extend activities to additional atolls. The reaction of Mohamed Shihab, director of external resources in Maldives' Ministry of Foreign Affairs is typical. "I'm quite satisfied with the progress," he says. "Disease has gone down with the construction of the rainwater catchment systems, and reef entrance has also been improved. That's like construction of roads in other countries."

Tuaiva Mautairi, Mangaia's mayor and chairman of the development coordination committee is also happy with the results. "People have been relying on outsiders to give them money," he says. "We are showing that we can do things on our own." ■



Jeff Liew discusses copra production with a villager.

JEFF LIEW

Grassroots development tactician

Suva, Fiji — "The shrapnel has added a good iron content to the soil," says Jeff Liew, reviewing the assets of Maloelap Atoll, in the Marshall Islands, which was bombed during World War II. "One can grow sweet potatoes, pumpkins and cantaloupes in the old bomb craters."

Discovering and making good use of island resources is just one of Mr. Liew's tasks as coordinator of the UNDP-supported Integrated Atoll Development Project. Covering a vast territory extending from the Marshall Islands to Tokelau in the Pacific, and Maldives in the Indian Ocean, he spends four months of the year visiting project sites — motivating, facilitating and checking progress.

Mr. Liew must also be fully in tune with the culture of the seven island countries in which the project is active, as well as with traditions on each atoll. Among his special skills are the ability to sit for long hours in the lotus position and dance the twist until midnight at village celebrations. He must also have the stamina to swim to shore when a boat capsizes. "I've gone down on reef passages six times so far," he says. "You swim. You hope the sharks don't get you."

Mr. Liew's communications skills have enabled him to develop extraordinary rapport with local fishermen and island chiefs, as well as government ministers and representatives of the international aid community. A typical day might find him discussing whether new improved fishhooks are likely to increase the catch. Or he could just as easily be found negotiating an agreement for the provision of fruit and nut trees with a bilateral donor. Frequently he turns up at government policy meetings to promote intersectoral planning.

Before joining the project, Mr. Liew worked with the South Pacific Commission in the Federated States of Micronesia. Born in 1954 in Malaysia, where he received his initial education, he earned an M.S. in Development Economics from the University of Otago, in New Zealand.

Mr. Liew refers to himself, his Filipino assistant and the United Nations Volunteers he supervises as "grassroots development tacticians." "You have to understand the complexity of the society before you can successfully do anything to ensure sustainability," he says. "Then you can find ways of getting people to do things."

One lesson was learned when it was decided to bring women from the five islets of Maloelap together on the main island for a week-long handicrafts workshop. "All was going well," recalls Mr. Liew, "but after three days the men sent boats to pick up their wives. They said they couldn't cope with the kids anymore, and that they hadn't had anything to eat. Now we have island by island workshops." — **M.L.H.**

Ambekar Eknath, a scientist at ICLARM, shows off the new "super" tilapia.

AQUACULTURE

Breeding an Aquatic Chicken

By Siddharth Dube

Muñoz, Philippines — Researchers here, through generations of breeding, have developed a super strain of tilapia that could revolutionize fish farming throughout the developing world.

Scientists at the International Center for Living Aquatic Resources Management (ICLARM) are calling the small, plump freshwater fish an "aquatic chicken."

Roger Pullin, who directs aquaculture research at ICLARM, says, "The tilapia has remarkable attributes as a food fish. It is delicious to eat, with no fine intramuscular bones. It is also easy to breed, cheap to feed, tolerant of wide ranges of temperature, salinity and water quality — and comparatively free from parasites and diseases."

Mr. Pullin and other experts at ICLARM have dedicated years to improving the tilapia through careful breeding. Their research has produced a hybrid tilapia that is larger and stronger than those farmed today in Asia. This tilapia is about to be introduced to Filipino fish farmers. ICLARM scientists expect it to herald a "blue revolution" in fish farming as important as the "green revolution" in food crops a quarter of a century ago.

This promise is based on the hybrid tilapia's ability to thrive under harsh conditions — which means that they can be farmed by poor families throughout the developing world.

Unlike other tilapias and tropical aquaculture fish, the hybrid tilapia prospers in flooded rice fields, vegetation-

choked ponds, or brackish water. They reach full size in less than 75 days — a full 30 days ahead of other tilapia species. The short maturing time means larger sales for poor farmers. It also means that rice farmers can stock their fields with the hybrid tilapias — impossible with slow-growing fish because rice fields are flooded for only three months at a stretch. And unlike most other fish currently used in tropical aquaculture, the hybrid tilapias do not require hormones or complex hatchery equipment to breed.

ICLARM scientists expect the new tilapia's plus points to make a significant impact on tropical fish farming. In Southeast Asia, where tilapias are already a major farm fish, they conservatively expect a 40 per cent jump in tilapia production once the hybrid is widely distributed to farmers. Tilapia farmers will at minimum net a 30 per cent increase in incomes. The hybrid may lead to large increases in Africa, where tilapias are the most important aquaculture fish.

ICLARM's success with the hybrid tilapia has not come easily. When Mr Pullin and other scientists at ICLARM began research on the tilapia, the first problem they faced was that modern aquaculture research had focused solely on improving non-tropical fish like the Norwegian salmon.

Nor was it clear at that time that tilapias could be improved to the degree that they have been at ICLARM. An early attempt three decades ago to introduce tilapia farming in Asia and Latin America had a mixed record. In India and Bangladesh, a species of tilapia, the *mossambicus*, soon crowded out native fish. Farmers complained that the *mossambicus* tilapia over-bred and produced small, inedible fish.

The answer to the *mossambicus* tilapia's predilection for in-breeding came in the shape of another member of the species, called the Nile tilapia. The Nile tilapia, which is found across Africa, can be cross-bred to produce all-male progeny. This averts the in-breeding problem. It is currently farmed extensively in Asia and annual production today in both the Philippines and Taiwan exceeds 60,000 tonnes.

Tilapia fingerlings will be sold to Filipino fish farmers.

PHILIPPINES

Photos by Siddharth Dube / UNDP

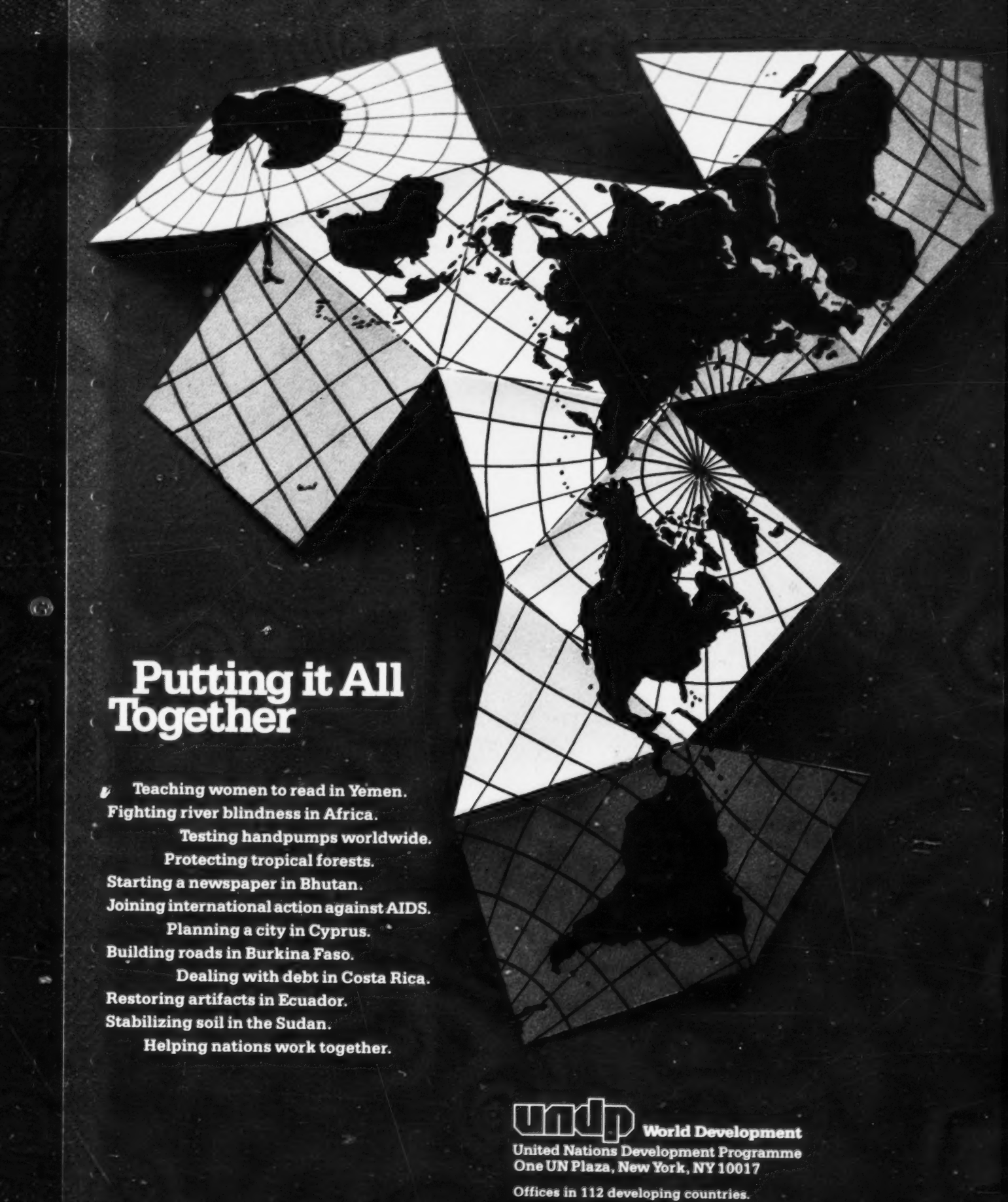
ICLARM scientists, with the support of the United Nations Development Programme (UNDP) then began to turn to improving the tilapia's size, maturing speed and robustness. In 1988 they journeyed to Africa, the tilapia's homeland, to collect fresh stocks of wild Nile tilapia. Over a thousand fingerlings and breeders were shipped from Egypt, Ghana, Kenya and Senegal to ICLARM's field station here at Muñoz, 200 kilometres north of Manila.

The intricate process of genetic improvement began. The four strains of wild Nile tilapia were crossed with four Philippine strains in every possible permutation. Their progeny were evaluated in test environments that ranged from ponds to rice fields. Winners were crossed again, to produce the most desirable strain of tilapia.

The result of all this careful breeding is ICLARM's hybrid "super" tilapia — pink-skinned, quick-growing, and strong. The hybrid has proven its ability to prosper in rice fields and water of poor quality. It now has to prove that it can revolutionize tropical fish farming. ■

Hybrid tilapia are being bred in fish farms in Muñoz.

An improved freshwater fish could boost tropical fish farming



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